The
VETERINARY RECORD
Founded by William Hunting, F.R.C.V.S., in 1888
7, MANSFIELD STREET, PORTLAND PLACE, LONDON, W.1. MUSEUM 6541
No. 47 NOVEMBER 19th, 1955 Vol. 67
Registered for Transmission as a Newspaper *Price 2s. post free*

An Experimental Assessment of the Value of Nitrofurazone Used Continuously as a Coccidiostatic Drug

BY
S. F. M. DAVIES and S. B. KENDALL
Ministry of Agriculture, Fisheries and Food, Veterinary Laboratory, New Haw, Weybridge

THE deep-litter system of poultry management is gaining popularity for the production of table poultry, mainly because of its great economy in labour requirements. The advantages of the system, may, however, be outweighed by loss from epidemic disease which arises from the crowding together of large numbers of birds with neglect of conventional hygienic precautions.

It is believed that the processes of decomposition which occur in litter may, under suitable circumstances, lead to the production of an environment so unfavourable for the sporulation of oocysts and the embryonation of the eggs of parasitic worms that disease of parasitic origin can be avoided. In Britain, however, experience has shown coccidiosis to be a major disease problem of deep-litter houses. In an effort to avoid serious loss from this cause the drug nitrofurazone, the use of which was first reported from America (Harwood & Stunz, 1949), has been recommended for continuous feeding at concentrations of between 0.005 per cent. and 0.01 per cent. of the dry mash which forms the principal diet of the birds from the time of hatching until they are killed for the table at about 12 weeks of age.

This paper considers some reasons why continuous treatment with nitrofurazone does not always avoid serious loss from caecal coccidiosis.

Experimental Techniques

The experimental work recorded in this paper was conducted in electrically heated wire-floored brooders using R.I.R. chicks of mixed sexes. Infection was initiated by the oral inoculation of known numbers of oocysts given as a single inoculum directly into the crop. It has occasionally been suggested that the single massive inoculum ordinarily used for drug-screening observations cannot be compared with the repeated infection which is assumed to occur under field conditions. The validity of this criticism depends upon the assumption that repeated infection offers a different sort of challenge to the resistance of the chick. For this assumption there is no evidence. Up to about 48 hours following an initial infection the repeated ingestion of oocysts apparently has an additive effect the precise clinical result depending on the sum of the oocysts ingested. In any event the observed effect does not differ from that of the single inoculum.

Seventy-two hours after oocysts have been ingested there is evidence (as shown by Kendall & McCullough (1952)) of the development of a considerable degree of resistance. By the 96th hour following an initial sublethal infection an inoculum which would ordinarily cause heavy mortality among susceptible birds has very little effect. Because the challenge to the physical resistance of the chick is delayed until the time at which the second generation schizonts mature it has not yet been possible to determine which stages in the development of the parasite are concerned with resistance. It is, however, clear that the immunological response must originate some time before the 72nd hour of normal development of the parasite and that infection repeated at an interval of more than 48 hours is not likely markedly to influence the course of disease.

In the field, it seems certain that infection sufficiently severe to produce death must have been contracted during a limited period of a few days only. Consequently, laboratory observations based on the single inoculum technique offer a close parallel with the conditions of an epidemic in the field.

The Efficacy of Nitrofurazone in Controlling Mortality from Acute Caecal Coccidiosis

In Britain, Horton-Smith & Long (1952) have recorded observations on the efficacy of nitrofurazone

in controlling caecal coccidiosis. In their conclusions they recommended feeding 0.011 per cent. of the drug in the mash as a " preventive " but they considered that a level of 0.022 per cent. was necessary for the treatment of established disease.

In America, Gardiner and Farr (1954) found that the drug had an adverse effect on growth when fed for a seven-day period at a level of 0.0216 per cent. of the food.

At a concentration of 0.0108 per cent. for seven days it was only slightly beneficial and its effects were inconsistent. When given for 28 days at a concentration of 0.0108 per cent. or 0.0112 per cent. the drug still gave only partial protection.

At Weybridge the efficacy of nitrofurazone has been tested using the known coccidiostatic activity of sodium sulphamezathine as a standard of comparison. At a level of 0.005 per cent. of the food, nitrofurazone had little effect on acute caecal coccidiosis. At a level of 0.01 per cent. fed from the 48th hour following infection, the drug proved very much less effective than sulphamezathine. Even at a concentration of approximately 0.02 per cent. of the food nitrofurazone was only partially effective against acute infection. This was demonstrated under controlled conditions in the laboratory.

A Comparison of the Coccidiostatic Effect of Nitrofurazone and Sodium Sulphamezathine

One hundred and twenty week-old chicks were infected each with sporulated oocysts of *Eimeria tenella*. in numbers sufficient to cause heavy mortality among untreated birds. Two groups each of 30 chicks were given nitrofurazone at a concentration of 0.0196 per cent. of the mash for seven days starting 48 hours after the time of infection. A further group of 30 chicks received sodium sulphamezathine at a concentration of 0.2 per cent. of the drinking water for five days from the 48th hour following infection. A fourth group of chicks served as an untreated control. Twenty-eight of these untreated birds died of acute caecal coccidiosis on the fifth and sixth days following infection. Fourteen birds in each group receiving nitrofurazone died between the fifth and seventh days following infection. By contrast, no birds died in the group of 30 which received sodium sulphamezathine.

It was clear that although nitrofurazone had a definite coccidiostatic effect, it was considerably less effective than sodium sulphamezathine.

It was possible, however, that nitrofurazone might be more effective if treatment preceded infection, and if this procedure led to the accumulation of a higher concentration of the drug in the tissues.

The Effect of Nitrofurazone when Treatment Precedes Infection

The drug was tested at a concentration of 0.01 per cent. of the food starting 48 hours before the time of infection. Table I indicates the mortality rate which followed infection of different batches each of 20 chicks with 10,000, 50,000 and 200,000 oocysts respectively.

The mortality rate following treatment with nitrofurazone (Group A) was compared with that following treatment with 0.2 per cent. sodium sulphamezathine given from the 48th hour following infection (Group B).

Group C (Table I) comprised batches each of 20 untreated chicks which served as controls.

It will be seen (Table I) that nitrofurazone had no significant effect on the mortality which followed infection with 50,000 or with 200,000 oocysts and that although there was a significant effect on the results of infection with 10,000 oocysts nevertheless seven out of 20 birds (*i.e.* 35 per cent.) died. By contrast the sulphamezathine effectively controlled the mortality which resulted from infection with 10,000 oocysts and markedly reduced the number of deaths which followed the higher rates of infection. As will be shown later, nitrofurazone was still relatively ineffective when treatment preceded challenge by as much as 17 days.

Observations by Davies & Joyner (1955) have shown that the average number of oocysts per gramme of deep litter is frequently between 10,000 and 100,000. In the field it seems probable, therefore, that chicks will frequently be subjected to infection at a level at least as high as in our experimental observations. It seems reasonable to conclude that the usually recommended " preventive " levels of 0.005 per cent. to 0.01 per cent. of nitrofurazone in the food are below the threshold necessary to ensure a satisfactory therapeutic effect.

TABLE I

A COMPARISON OF THE EFFICACY OF NITROFURAZONE AND OF SODIUM SULPHAMEZATHINE IN CONTROLLING MORTALITY FROM CAECAL COCCIDIOSIS

		Percentage mortality following infection (20 chicks per group)		
		10,000 oocysts	50,000 oocysts	200,000 oocysts
A	Nitrofurazone (0·01 per cent. from 48th hour preceding infection)	35	100	95
B	Sodium sulphamezathine (0·2 per cent. from 48th hour following infection)	5	30	30
C	Control (no treatment)	95	100	100

The Effect of Continuous Treatment with Nitrofurazone on the Development of Resistance to Repeated Infection

The experiment recorded in Table II was designed to test the effect of continuous treatment (starting a week before initial infection) with 0.01 per cent. nitrofurazone on repeated infection with *E. tenella*. In the laboratory 150 three-week-old chicks, which were receiving continuous treatment with 0.01 per cent. nitrofurazone were inoculated each with 800 sporulated oocysts of *E. tenella*. Successive batches of 15 chicks then received a challenge inoculum of 100,000 oocysts, the first batch being inoculated 24 hours after

initial inoculation and so on up till the 10th day. Mortality was recorded up till the eighth day following the day on which the tenth and final batch of chicks had been challenged. This procedure was intended to simulate, under controlled conditions, the type of flock infection which might be experienced in the field. The recorded mortality from caecal coccidiosis was compared with that which occurred in similar birds which had received an initial infection followed by a challenge infection at intervals of one to ten days subsequently but which did not receive any therapeutic treatment.

Results

Results of the observations are recorded in Table II, Group 1 containing birds which received dry mash with 0.01 per cent. nitrofurazone for a week before initial infection and then continuously until the observation terminated. Group 2 comprised batches of chicks which did not receive any treatment during the course of the observation. Mortality in this group occurred principally among those birds which were reinfected 24 hours (Batch A) and among those birds reinfected 48 hours (Batch B) after the initial infection. Thereafter, the resistance arising from the initial infection became apparent and mortality in the remaining batches was inconsiderable. Altogether a total of 26 out of 150 chicks died from caecal coccidiosis.

Mortality among the treated birds (Group 1) was initially very similar, 10 birds dying in each of the batches (A and B) which were respectively reinfected 24 and 48 hours after the initial inoculation. Subsequently, however, considerable further mortality occurred and a total of 46 out of 150 initially in the group died from caecal coccidiosis.

Discussion

Although large quantities of nitrofurazone are at present being sold in Britain for the continuous medication of poultry foods there is little critical evidence to indicate whether or not the drug has a significant effect on the incidence of disease. It is certainly common experience to find that serious outbreaks of coccidiosis arise in spite of the continuous use of nitrofurazone. Reliable direct assessment of the value of the drug in the field is difficult to obtain at a time when there are rapid changes in the techniques of management of the deep-litter houses where most of the drug is used. As a rule a reduction in the incidence of coccidiosis can be associated with a number of changes which experience has suggested to the new industry over the last few years.

It has been suggested by Brackett & Bliznick (1949), that long term continuous drug administration must depend for its success upon one or more of the following possibilities:—

1. That the drug is given continuously in full therapeutic doses in anticipation of a fatal infection.

2. That the drug is given in small doses which accumulate in the tissues to produce a therapeutic concentration by the time an outbreak occurs.

TABLE II

COMPARING MORTALITY FROM CAECAL COCCIDIOSIS RESULTING FROM A REPEATED INFECTION IN CHICKS RECEIVING NITROFURAZONE AND THOSE RECEIVING NO TREATMENT

Days following initial infection	(Group 1—150 chicks) Receiving 0·01 per cent. nitrofurazone continuously in the food									
	A	B	C	D	E	F	G	H	J	K
(1)	X									
(2)		X								
(3)			X							
(4)				X						
(5)					X					
(6)	1					X				
(7)	9						X			
(8)		10						X		
(9)			4						X	
(10)										X
(11)										
(12)						1				
(13)						2	1			
(14)						1	1	2	2	
(15)									2	
(16)								1		9
(17)										
(18)										
(19)										
(20)										
Total mortality	10	10	4	0	0	4	2	3	4	9
	46									

Days following initial infection	(Group 2—150 chicks) Receiving no treatment									
	A	B	C	D	E	F	G	H	J	K
(1)	X									
(2)		X								
(3)			X							
(4)				X						
(5)					X					
(6)	8					X				
(7)	2	7					X			
(8)		1	2					X		
(9)				2					X	
(10)										X
(11)			1							
(12)		1								
(13)						1				
(14)	1									
(15)										
(16)										
(17)										
(18)										
(19)										
(20)										
Total mortality	11	9	3	2	0	1	0	0	0	0
	26									

X = Indicates time challenge inoculum with 100,000 oocysts.

3. That the drug has an indirect effect in prolonging the period in which the epidemic develops. In this way the birds are able to attain effective immunity before being exposed to an otherwise fatal number of oocysts.

4. That less than therapeutic doses may suppress early light infections and avoid the accumulation of a lethal contamination of oocysts in the litter.

These possibilities may be considered having regard to experimental evidence of the efficacy of nitrofurazone.

Our controlled observations (reported in Table I) have shown that nitrofurazone at a concentration of 0.01 per cent. of the food is only partially effective against experimental infection of a severity which is believed to be comparable with that which causes deaths in the field, and the results recorded in Table II do not suggest that the effect of the drug is increased when treatment precedes infection by as much as 17 days.

In addition there is clear evidence, under the particular circumstances of the experiment (Table II) of interference with development of the resistance which in the untreated birds of Group 2, markedly reduced mortality providing reinfection occurred more than 48 hours after initial infection.

Brackett & Bliznick (1949) suggested that continuous administration of a drug might increase the period of time during which birds were able to develop resistance before being exposed to an otherwise fatal number of oocysts. Nitrofurazone at a concentration of 0.01 per cent. of the food can evidently produce the entirely opposite effect.

There is considerable evidence (Horton-Smith & Taylor, 1945; Cuckler & Ott, 1947, and Horton-Smith & Long, 1952) for the belief that all drugs used for the control of caecal coccidiosis have a marked effect on the second generation schizonts. All are coccidiostatic and either directly, or indirectly as suggested by Kendall & McCullough (1952) coccidiocidal. It is reasonable to infer that a reduction in the number of schizonts is likely to lead to a reduction in the number of oocysts which terminate the life cycle, although as suggested by Horton-Smith & Long (1952) much of the experimental evidence adduced in favour of this supposition could be negated on the grounds that observations were carried out during too limited a period of time. Temporary inhibition of schizogony in treated birds may be followed by delayed oocyst production.

It is clear, however, that a consistent reduction in the number of parasites resulting from successive infections might eventually cause a significant reduction in the numbers of infective oocysts in the litter. Brackett & Bliznick in 1949 made reference to this possibility when discussing the use of sulphaquinoxaline and nitrophenide. Their more recent observations (1952) have, however, shown that the total number of oocysts produced by any one chick is by no means directly related to the number originally ingested. A " crowding " effect appears to occur in the caecal epithelium and it can be shown that more severe infections do not necessarily yield larger numbers of oocysts. Excessive damage to the wall of the caecum with the development of a large caecal core may moreover lead to a reduction in the number of viable oocysts passed with the faeces.

It seems reasonable to conclude, therefore, that although nitrofurazone can be shown to cause a significant reduction in the number of oocysts observed during specific periods following experimental infection it is unlikely to have a comparable effect on the numbers of oocysts which finally accumulate in the litter under field conditions.

On the basis of available experimental evidence it is, therefore, difficult to understand how the continuous use of nitrofurazone can be expected to avoid the appearance of serious outbreaks of caecal coccidiosis.

Summary

1. Under experimental conditions nitrofurazone, given at concentrations in the food of 0.01 per cent. or 0.0196 per cent. proved markedly less effective than sodium sulphamezathine (given as 0.2 per cent. of the drinking water) in reducing mortality from caecal coccidiosis.

2. Treatment at a concentration of 0.01 per cent. for as long as 17 days before the time of heavy infection failed to provide full protection. There was evidence, moreover, of an interference with the development of the resistance which ordinarily protects untreated birds against infection.

3. The rationale of continuous treatment with nitrofurazone is considered.

References

BRACKETT, S., & BLIZNICK, A. (1949). *Ann. N.Y. Acad. Sci.* **52.** 4, 595–610.

——— & ———. (1952). *J. Parasit.* **38.** 133.

CUCKLER, A. C., & OTT, W. H. (1947). *Ibid.* **33** (6), Sect. 2, 10.

DAVIES, S. F. M., & JOYNER, L. P. (1955). *Vet. Rec.* **67.** 193.

GARDINER, J. L., & FARR, M. M. (1954). *J. Parasit.* **40.** 42.

HARWOOD, P. D., & STUNZ, D. I. (1949). *Ibid.* **35.** 175–182.

HORTON-SMITH, C., & LONG, P. L. (1952). *Brit. Vet. J.* **108.** 47–57.

———, & TAYLOR, E. L. (1945). *Vet. Rec.* **57.** 35.

KENDALL, S. B., & MCCULLOUGH, F. S. (1952). *J. Comp. Path.* **62.** 116.

ELECTRONIC DETECTOR TO ASSIST SHEEP DIGGING

It is reported that electronic equipment sensitive enough to amplify into headphones the sound of a sheep's heartbeats, even though the animal is some feet under ice-bound snow, is being developed by technicians at a Birmingham laboratory.

It is claimed that the detector will revolutionise sheep-digging methods and save farmers thousands of pounds every winter.

The electronic machine will find only live sheep.

Dogs can trace buried animals accurately but cannot differentiate between a live sheep and a dead one.

Training dogs to do the work is not easy, and they do not work as well as they might with any person other than their master.

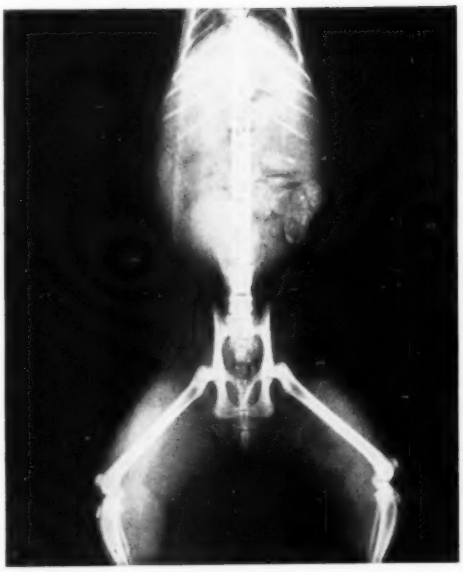

FIG. 1.—The control and before injection. The compression and bladder anterior thereto can be seen. Subsequently the bladder was retained posterior to the compression.

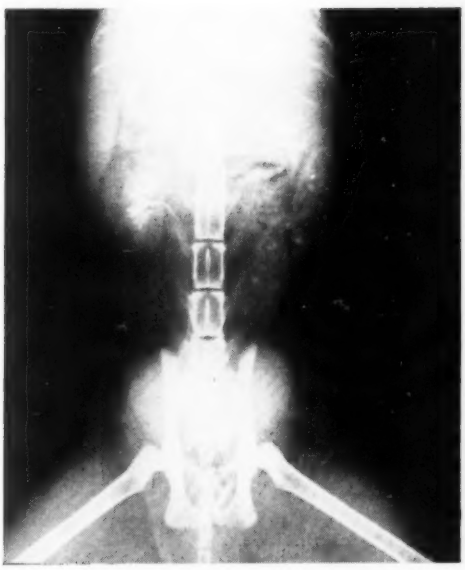

FIG. 2.—Three minutes after commencement of the injection. The kidney outline, renal pelves and ureters are visible.

FIG. 3.—Five minutes after commencement of the injection. Similar to Fig. 2 but the renal pelves are more distinct.

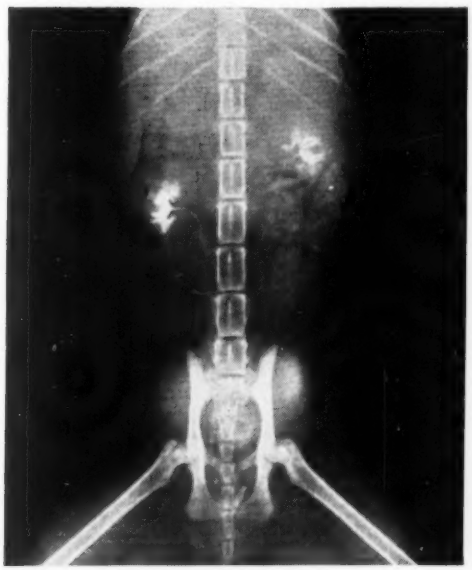

FIG. 4.—Ten minutes after commencement of the injection and with the compression still not altered. Kidneys and ureters show clearly.

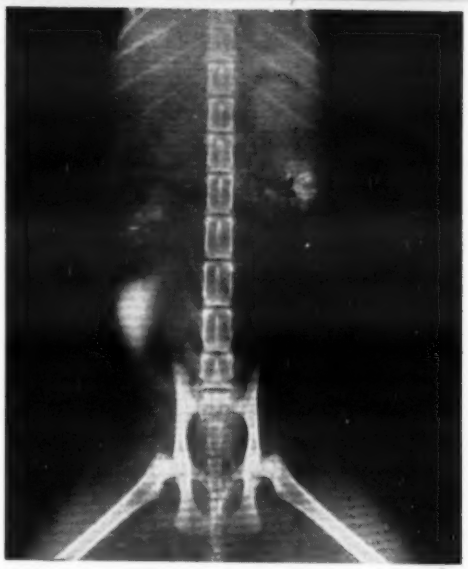

FIG. 5.—Fifteen minutes after commencement of the injection and five minutes after removal of the compression. The concentration in the kidneys is decreasing, especially in the left. Some of the Hypaque may be seen in the bladder. The cat recovered normally and showed no sequelae.

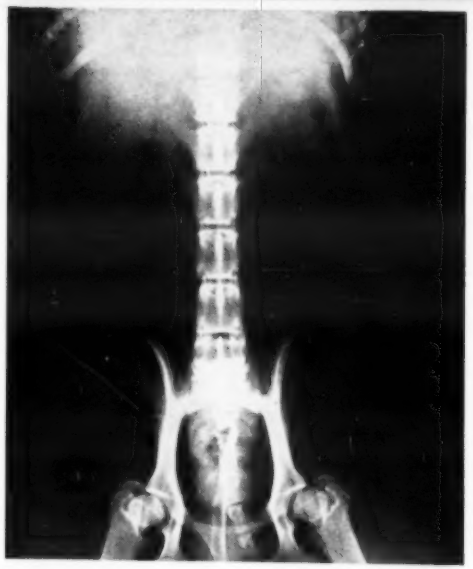

FIG. 6.—The control and before injection. Neither compression nor bladder are visible.

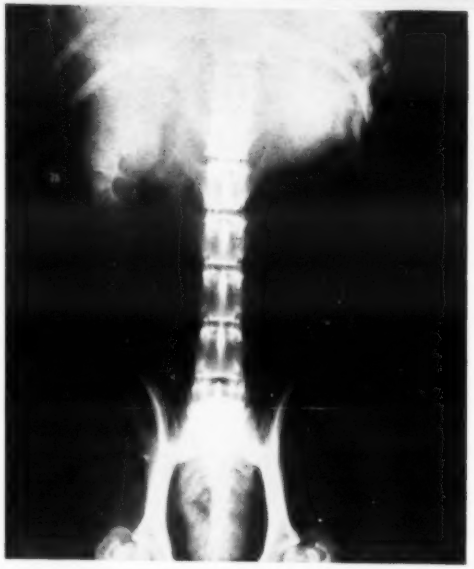

FIG. 7.—Three minutes after commencement of the injection. The kidney outline and renal pelves are just visible.

FIG. 9.—Twelve minutes after commencement of the injection and immediately after release of the compression. The

FIG. 10.—Twenty-four minutes after commencement of the injection and 12 minutes after release of the compression. The Hypaque has passed through to the bladder

Hypaque, a New Urographic Contrast Medium

BY

E. M. HARROD and R. CHURCHILL FROST

Royal Veterinary College and Hospital, London

Description

HYPAQUE is a new radio-opaque medium for intravenous excretion urography. It is a 45 per cent. aqueous solution of sodium diacetamidotriiodobenzoate, containing 59·87 per cent. iodine. The solution also contains a stabiliser and each ml. of solution contains 270 mg. iodine.

Indications

Hypaque has in man proved superior to any other medium at present available for radiography of the renal pelves, ureters and bladder. Unpleasant side effects are largely limited to a metallic taste in the mouth and the occasional case of nausea. There is a high incidence of superior plates and a low incidence of unsatisfactory visualisation. Our work has been to evolve a satisfactory technique for use in the cat and dog. In the recorded cases no special preparations were undertaken. There was no deprivation of fluids or food and no emptying of the bladder or rectum. In other cases in the dog it was sometimes found desirable to empty the bladder.

On the attached art plate the legend under each radiograph is self explanatory.

Technique in the Cat

The subject was a female aged six and a half months and weighing 5 lb. 6 oz. suffering from haematuria and suspected of renal abnormality. The cat was anaesthetised with intravenous nembutal and retained in the supine position. Abdominal compression was obtained by tying a two-inch bandage round the abdomen over two pads of cotton wool. These pads were placed lateral to the mid-line and posterior to the umbilicus to bring pressure to bear on the ureters and so slow the rate of excretion.

Each film was exposed as follows:— 55kV, 250mA, 0·15 seconds at a distance of 36 inches with a stationary Lysholm grid placed in the cassette. The films used were Kodak Blue Brand with high definition intensifying screens. Having taken a control film (Fig. 1) to ascertain that the abdomen was suitably empty for urography and also to obtain the exposure required, Hypaque 4 ml. were injected continuously intravenously over a period of 60 seconds.

Technique in the Dog

The subject was a male Boxer aged 10 months and weighing 53 lb. suffering from polyuria and suspected of renal abnormality. The dog was anaesthetised with nembutal intravenously and retained in the supine position. Ventral abdominal pressure was obtained by tension across the table and the dog over two pads of cotton wool placed as in the cat. Each film was exposed as follows:—65kV, 250mA, 0.3 seconds at a focus film distance of 36 inches, with a stationary Lysholm grid placed in the cassette. The films used were Kodak Blue Brand with high definition intensifying screens. Having taken a control film (Fig. 6) for the same reasons as in the cat, Hypaque 20 ml. were injected continuously intravenously over a period of 60 seconds.

Conclusions

It will be seen that it is best to expose plates five or six minutes after the commencement of the injection to visualise the kidneys and ureters. A second exposure at about the 10th or 12th minute is also desirable. The bladder is seen best at about the 20th minute and after release of the compression for about 10 minutes.

Summary

A simple technique is described for intravenous excretion urography in the cat and dog.

Acknowledgments.—Mr. G. C. Knight for co-operation and advice in this work. Messrs. Bayer Products Ltd., who manufactured and supplied Hypaque.

References

DRURY, F., DYCE, K. M., & MERLEN, R. H. (1953). *Vet. Rec.* **65.** 647-8.

ROLLINS, M. R., BONTE, F. J., ROSE, F.A., & KEATING, D. R. (1955). *Amer. J. Roent.* **73.** 77.

ROOT, J. C., & STRITTMATTER, W. C. (1955). *Ibid.* **73.** 768.

WALKER, J. H., *et al.* Bull Mason Clinic, Seattle. (1955). **9.** 1.

PRESENTATION OF POULTRY RESEARCH AWARDS

Mr. Arthur Moyle, C.B.E., M.P., Senior vice-President of the Poultry Association of Great Britain presided at a ceremony in the Strangers' Dining Room of the House of Commons on November 10th when awards were made to two veterinarians. The Tom Newman Memorial Award was made to Dr. H. Williams Smith of the Animal Health Trust for the most meritorious piece of research work for the benefit of poultry husbandry published last year. The prize takes the form of a gold medal and a cheque for £50, and is open to international competition.

A distinguished service award, comprising a bronze medal and a parchment citation was made to Mr. J. E. Wilson, who is in charge of the Ministry's laboratory at Lasswade.

The presentations were made by Mr. G. H. R. Nugent, M.P., Parliamentary Secretary to the Ministry of Agriculture, who was deputising for the Minister.

Biochemistry of the Cerebro-spinal Fluid of the Dog

BY

PHYLLIS G. CROFT

Group Laboratory, Mile End Hospital, London, E.1*

EXAMINATION of cerebro-spinal fluid has been a routine diagnostic procedure in human medicine for many years, but in veterinary medicine few investigations have been made and the normal range of concentrations of some components is not accurately known. The work described in this paper was carried out on dogs and its objects were, firstly, to establish normal ranges for the common constituents of cerebro-spinal fluid and, secondly, to examine specimens from any available clinical cases with nervous manifestations.

Experimental Material

Normal samples of cerebro-spinal fluid (c.s.f.) were obtained from 25 dogs of various breeds, ranging in age from six months to seven years. The majority of these dogs were in the breeding unit of the Canine Research Station of the Animal Health Trust (C.R.S.); a few samples were taken from dogs brought in by veterinary surgeons for treatment of some condition which did not involve the nervous system. A small number of samples were taken from carcases sent to the C.R.S. for *post-mortem* examination. These were only taken if a relatively short time had elapsed since death, and control experiments were carried out to determine which constituents could be reliably estimated under these conditions.

Pathological c.s.fs. were taken from 17 dogs which showed clinical signs of damage to the nervous system. The dogs were of various breeds and their ages ranged from five weeks to six years. The majority of the dogs were believed to be infected with distemper complex virus, and whenever possible this was checked by ferret inoculation. As in the normal group, a proportion of c.s.f. samples were taken from carcases and only a limited number of estimations could be done on these samples.

A third group consisted of dogs which had been hyper-immunised against canine distemper complex, and subsequently used for the production of gamma-globulin. Some of these dogs had been used for previous immunisation experiments, so it was difficult to assess accurately the condition of their nervous system. However, all dogs were destroyed at the time the c.s.f. was taken, so histological examination could be made and the findings compared with the analyses of the c.s.f.

Methods

C.s.f. was obtained from the cisterna magna by insertion of a needle through the atlanto-occipital space as described by Brook (1936). Light general anaesthesia was induced with pentobarbitone sodium. C.s.f. can be taken with local anaesthesia and a narcotic, but it is desirable to keep the dog quiet for some time after cisternal puncture, and hence general anaesthesia is more satisfactory unless the animal is toxic. Morphine cannot be used as a narcotic because it affects the sugar in c.s.f. Barbiturates, however, have no effect on any of the usual constituents.

Two to 6 ml. were usually withdrawn, slowly, and the colour, consistency and volume noted as the fluid entered the syringe. Occasionally contamination with blood occurred; cell counts were not possible on these samples and glycolysis was likely to occur if the blood was not removed quickly by centrifugation. In some cases blood was present in the c.s.f. as a result of the pathological changes which had occurred in the nervous system, whereas in others it was introduced during puncture. It was possible to tell with practice whether or not the blood was introduced accidentally during puncture.

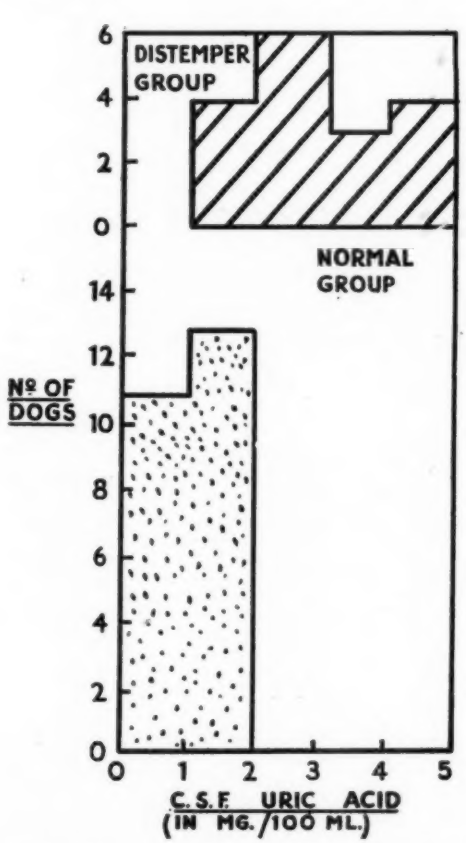

FIG. 1.—Distribution of c.s.f. uric acid levels in normal and distemper groups.

* Now at UFAW, 7a, Lambs Conduit Passage, London, W.C.1.

Sugar and uric acid were estimated immediately after the sample was taken, and cell counts were usually done on the same day and smears stained if necessary. Protein and chloride estimations were done on the following day, the c.s.f. being stored at +3° C. overnight. Sugar was estimated by the method of Folin & Wu; 0.1 ml. c.s.f. was used for each estimation and the colour of the final solution compared with that of a standard solution in a photo-absorptiometer. Uric acid was estimated by the method of King *et al.* (1937); this determination is very sensitive and the final colour is easily affected by interfering substances. Repeatable results were obtained so long as a blank and standard were used with every estimation. Protein was estimated by the biuret method (Harrison, 1949), the colour of the final solution being compared with that of a standard solution of biuret in a photo-absorptiometer. When the cell count was high, a smear was made and stained with Leishman's stain so that the type of cell present could be examined. Centrifuged deposits were examined bacteriologically when there was clinical evidence of disease, and in likely cases the c.s.f. was examined for the presence of the virus of canine distemper complex. Globulin was estimated qualitatively by the Nonne-Apelt reaction, and chlorides were assessed by titration with a standard solution of silver nitrate.

Results

Appearance.—The appearance of the c.s.f. gave a good indication as to whether it was normal or pathological; a clear, colourless fluid of watery consistency was almost always normal biochemically and had a very low cell count. The pathological samples were usually cloudy and occasionally sticky; clear samples of a pale yellow colour indicated slight contamination with blood at the time of puncture. The only clinical case of acute canine virus hepatitis seen had a c.s.f. which contained haemolysed blood.

Sugar.—The distemper group tended to have lower values than the normal group, whilst the hyperimmunised dogs had rather higher values. In all groups the range of c.s.f. sugar was very wide and single estimations appeared to be valueless from the diagnostic point of view. There was no obvious correlation between the clinical picture and the level of sugar in the c.s.f.

Chlorides.—The chloride concentrations of the distemper group showed a slightly wider range than those of the normal group, but, again, values for individual animals showed no correlation with the clinical condition. The lowest value (600 mg. per 100 ml.) was found in a dog which died as a result of distemper immunisation, but which showed no neurological signs. The range of chloride concentrations in the hyperimmunised group was similar to that of the normal group.

Proteins.—C.s.f. samples from the normal group never contained protein in sufficient concentration to give a biuret reaction which could be measured on the photo-absorptiometer. Teunissen & Verwer (1953) give 11 to 55 mg. per 100 ml. as the normal range, and since 50 mg. per 100 ml. could be detected on the photo-absorptiometer, it appears that the normal group at the C.R.S. was similar to Teunissen & Verwer's with respect to protein. Traces of globulin were seen in about a third of the samples from the normal group. This constituent was only estimated qualitatively, but there was no indication that it was ever more than 10 mg. per 100 ml.

TABLE I
C.S.F. CONSTITUENTS OF NORMAL DOGS

Number	Appearance	Sugar (mg. per 100 ml.)	Chlorides (mg. NaCl per 100 ml.)	Protein	Globulin	Cells (per cu. mm.)	Uric acid (mg. per 100 ml.)
1	Clear, watery	75	830	—	—	114	1·8
2	Opalescent and watery	87	790	—	—	13	1·5
3	Clear, watery	85	790	—	—	95	1·5
4	Clear, watery	86	820	—	—	5	1·4
5	Grey, watery	90	830	—	—	1,200	1·4
6	Pale yellow and watery	74	780	—	—	70	1·4
7	Clear, watery	88	820	—	±	78	1·4
8	Clear, watery	85	810	—	±	284	1·4
9	Clear, watery	75	810	—	±	56	1·4
10	Clear, watery	74	790	—	—	59	1·3
11	Clear, watery	73	790	—	±	254	1·2
12	Clear, watery	67	790	—	±	56	1·1
13	Clear, watery	64	810	—	±	209	1·1
14	Clear, watery	110	790	—	—	116	1·0
15	Clear, watery	88	810	—	±	51	1·0
16	Clear, watery	70	860	—	±	138	1·0
17	Grey, watery	78		—	±	220	0·8
18	Clear, watery	91	800	—	±	42	0·7
19	Yellow, watery	79	800	—	—	151	0·6
20	Clear, watery	72	810	—	—	650	0·6
21	Clear, watery	76	860	—	—		
22	Opalescent and watery	81	720	—	—	28	0·4
23	Clear, watery	76	840	—	—	81	0·4
24	Clear, watery	131	780	—	—		0·3
25	Clear, watery	60	780	—	—	60	0·3

TABLE II
C.S.F. CONSTITUENTS OF DOGS WITH DISTEMPER

Number	Appearance	Sugar (mg. per 100 ml.)	Chlorides (mg. NaCl per 100 ml.)	Protein (mg. per 100 ml.)	Globulin	Cells (per cu. mm.)	Uric acid (mg. per 100 ml.)	Clinical signs and histology
1	Sticky + pus and blood			1,350			4·7	Fits. *B. coli* isolated from brain surface. H.
2	Cloudy						4·6	Fits.
3	Cloudy	53	700	650	+	2,446	4·5	H.
4	Cloudy	40	660		±	2,450	4·4	Fits. V. H.
5	Blood-stained						4·0	Distemper following inoculation.
6	Blood-stained						3·5	Fits, chorea. V.
7	Cloudy	37	780	440	±	411	3·3	C.D. epidemic. V. H.
8	Cloudy	34	600	690		317	2·7	V. H.
9	Cloudy	77	780	250	++	4,500	2·6	Distemper following inoculation. V. H.
10	Cloudy	31	880	Nil	Nil	1,500	2·6	C.D. epidemic.
11	Yellow	106		130	±	185	2·5	H.
12	Blood-stained						2·5	C.D. epidemic. V.
13	Cloudy + pellicle	49	880	760	++	4,900	2·4	C.D. epidemic. Fits.
14	Blood-stained						2·0	C.D. epidemic.
15	Cloudy	98		950	++	7,275	1·9	Fits. H.
16	Cloudy			1,500			1·7	V.
17	Pinkish	95		550	++	76	1·1	Chorea following sub-clinical C.D.

Notes.—V. Presence of virus proved by ferret inoculation.
H. Perivascular cuffing or demyelination evident in histological sections of the brain.
C.D. Canine distemper complex.
Samples from these dogs were not always easy to obtain, as the animals were often toxic or difficult to handle ; when a small volume was taken, the estimations likely to be of greatest interest were carried out. Samples contaminated with blood were useless for certain estimations. Nevertheless, all specimens taken from dogs believed to have been infected with distemper are included, so as to give a true picture of the experimental work.

In the distemper group of dogs, protein was present in 10 out of 11 of the samples in which it was estimated. The concentration ranged from 130 to 1,500 mg. per 100 ml. Although a high c.s.f. protein was always associated with extensive damage to the nervous system, the converse was not necessarily true. Globulin was usually found in association with protein, but the amount was not proportional to the protein concentration. The presence or absence of protein could usually be detected when c.s.f. was withdrawn, since samples containing measurable amounts of protein were cloudy whilst normal samples were clear. Specimens from the hyperimmunised group contained no protein except for dog No. 13. This c.s.f. was sticky and contained fibrinogen, but it was too viscous to manipulate accurately and quantitative estimations were not feasible.

Cells.—The cell count corresponded with the protein level, but there was considerable overlap between the highest levels in normal dogs and the lowest levels in dogs with nervous abnormalities. The range in the hyperimmunised dogs was also wide, and the highest count in any group occurred in dog No. 12 in this group. This animal had been used extensively for immunisation experiments over a period of years. In most specimens the cells were lymphocytic, but occasionally in distemper cases with marked nervous signs, some neutrophils were seen with the lymphocytes.

Uric acid.—Uric acid concentration provided the sharpest differentiation between normal dogs and those in the distemper group. The range in the normal group was from 0.3 to 1.8 mg. per 100 ml., and in the distemper group from 1.1 to 4.7 mg. per 100 ml. The hyperimmunised group occupied again an intermediate position, with a range of 0.5 to 2.9 mg. per 100 ml. Blood uric acid estimations were done on a number of dogs in all groups and did not show the same trend as the c.s.f. levels.

Discussion

Sugar.—Lowered c.s.f. sugar has long been considered as a cardinal sign of meningitis in man; in tuberculous meningitis values from 11 to 27 mg. per 100 ml. are common, and in coccal meningitis sugar may be absent. The main cause of the lowering of the sugar is utilisation by the infecting organisms. Meningitis due to non-glucose-fermenting organisms, such as diphtheroids, does not produce abnormal sugar levels.

In the present investigation sugar concentrations in the c.s.fs. of the distemper group did not differ significantly from those in the other group. Cloudy specimens of c.s.f. were cultured, but bacterial growth occurred in only one case (No. 1 in Table II). These observations support the view already put forward by Teunissen & Verwer (1953) that meningitis in the dog is viral, not bacterial, in origin.

Blood sugar estimations were done on the dogs in the hyperimmunised group which had abnormal c.s.f. sugar levels. These indicated that the high c.s.f. concentrations were reflections of high blood levels, but the low values could not be explained in this way.

Chlorides.—Lowering of c.s.f. chlorides in man is typical of meningitis; values between 650 and 680 mg.

per 100 ml. are found in coccal meningitis, whilst in tuberculous meningitis the level may be as low as 500 mg. per 100 ml. The normal values for c.s.f. chlorides in the dog were more variable than in man, and in general rather higher. There was no obvious correlation between lowered c.s.f. chlorides and meningitis in the dog; this reinforces the conclusion drawn from the results of the c.s.f. sugar estimations, that meningitis in the dog is not comparable with bacterial meningitis in man.

Protein and cells.—An increase in protein without an increased cell count is commonly found in man in cerebral arterio-sclerosis, polyneuritis and some brain tumours. In these conditions protein values of 100 to 250 mg. per 100 ml. are usual. A combined increase in cells and protein is more usual and is considered to be diagnostic of meningitis. Protein concentrations associated with high cell counts may reach a value of 500 mg. per 100 ml.

An increase in the c.s.f. protein occurred in 10 out of the 11 dogs of the distemper group in which it could be estimated. The one dog (No. 10, Table II) in which no protein was present in the c.s.f. died after inoculation during a distemper epidemic. The dog was comatose when it arrived at the C.R.S., but the history included typical convulsions of the type seen in that particular epidemic. The majority of the other cases in which the c.s.f. protein was high were in the convulsive stage when the sample was taken. It is possible that protein levels may become more normal as the acute convulsive phase passes.

Cell counts in the normal group were high by comparison with man, so it is important to realise that an isolated high cell count may have no pathological significance. Protein, on the other hand, was never found in a normal c.s.f.

Any excess in the c.s.f. globulin was generally associated with serious damage to the central nervous system. In one dog (No. 17, Table II) a marked excess of globulin was the only biochemical or histological abnormality which could be found in a case of persistent chorea following mild distemper. Unfortunately no specimens had been taken from this dog before it contracted distemper, but it seems unlikely that the globulin was present then, as no dog in the normal group had more than a trace of globulin.

The only outstanding result in the hyperimmunised group was that of dog No. 12 (Table III), which had a very high cell count. This animal appeared to be in good health at the time of death but it had been hyperimmunised against a variety of diseases during the past four years and had been the subject of a number of immunity experiments. The majority of dogs in the group had had only a single course of immunising injections.

It is not possible to draw any definite conclusions from this preliminary survey, although it is obvious that an increase in c.s.f. protein is associated with inflammation of the central nervous system. Investigation of globulin levels might provide useful information, and also protein estimations at successive stages of an attack of canine distemper. Cell counts do not seem to be closely associated with the pathology of the nervous system, and are unlikely to be helpful in differential diagnosis and prognosis.

Uric acid.—In the virus conditions of poliomyelitis and encephalitis lethargica high c.s.f. uric acid levels have been reported in humans (Bernhard, 1924), and in a few cases of meningitis values of 3.5 and 4.8 mg. per 100 ml. have been found. The ratio between c.s.f. and blood uric acid in man is normally 1 : 5, but in these conditions it may be only 1 : 2.

TABLE III

C.S.F. CONSTITUENTS OF HYPERIMMUNISED DOGS

Number	Appearance	Sugar (mg. per 100 ml.)	Chlorides (mg. NaCl per 100 ml.)	Protein	Globulin	Cells (per cu. mm.)	Uric acid (mg. per 100 ml.)
1	Watery, sl. contamination with blood	36					2·9
2	Watery, clear	91	780	Nil	Nil	90	2·1
3	Watery, clear	110	750	Nil	Nil	185	2·0
4	Watery + some blood	86	770	Nil	Nil		1·9
5	Watery, clear	86	780	Nil	+	Nil	1·8
6	Watery, clear	167	720	Nil	Nil	Nil	1·6
7	Watery, clear	178	780	Nil	Nil	Nil	1·6
8	Watery, clear	25	900	Nil	±	Nil	1·5 Bacteraemia
9	Watery + some blood		760				1·4
10	Watery + some blood	137	770		±		1·3
11	Watery + some blood	176	780				1·3
12	Cloudy and watery	64	800	Nil		20,000	1·3
13	Sticky	240	790	Fibrinogen	++		1·2
14	Clear, watery	58	790	Nil	Nil	56	1·2
15	Clear, watery	112	800	Nil	Nil	14	1·2
16	Clear, watery	195	840	Nil	Nil	Nil	1·1
17	Clear, watery	64	840	Nil	Nil	195	0·9
18	Clear, watery	57	800	Nil	Nil	230	0·9
19	Cloudy, watery	73	780	Nil	Nil	6	0·8
20	Clear, watery	72	780	Nil	Nil	6	0·7
21	Clear, watery	69		Nil	Nil	Nil	0·5
22	Clear, watery	65	800	Nil	Nil	490	0·5

Uric acid in canine c.s.f. proved to be the only constituent examined in the present work which provided a clear correlation with the clinical signs and with the histopathological picture. If the normal limits of uric acid concentration are taken as 0.3 to 1.8 mg. per 100 ml. (Table I), it will be seen that only two of the 17 dogs of the distemper group had values which came within these limits (Table II and Fig. 1). The specimen from one of these dogs was taken some weeks after the attack of distemper had subsided, and it is possible that the uric acid level had been higher when the condition was acute. The other case (Table II, No. 16), had a uric acid level which was very close to the upper level of normality, and in view of the difficulty of obtaining reliable duplicate estimations of uric acid, great significance cannot be given to borderline cases.

There are two possible explanations of the increased c.s.f. uric acid. It could be due to increased permeability of the blood-brain barrier, since the normal blood level is higher than the c.s.f. level. Alternatively, it could be due to an increased destruction of cell nuclei *in situ*. The behaviour of other constituents which are affected by the permeability of the blood-brain barrier did not support the theory that this barrier was ineffective. It therefore seemed probable that the uric acid was derived from cell nuclei. In human leukaemia, the blood uric acid is raised by destruction of cell nuclei, and a similar condition occurred in the cases of leukaemia which were seen at the C.R.S.

There was some indication that c.s.f. uric acid levels had prognostic value; an increase occurred in a few cases after the initial febrile stage had passed and before any nervous signs appeared. These dogs subsequently developed fits or paralysis. If this finding is confirmed by a survey on a larger number of dogs, it might be of practical value in predicting damage to the central nervous system. It might then be possible to check the invasion of the nervous system by virus and minimise the damage.

Nervous conditions are now common in the dog, and the aetiology is frequently obscure. C.s.f. examinations are one of the most likely methods of learning more about these conditions, and the experiments described in this paper show that the procedure can provide useful information. Only when the aetiology of these diseases is properly understood, will it be possible to make attempts at rational therapy.

Summary

Values for the common chemical and cytological constituents of c.s.f. of 25 normal dogs are given. These values are compared with those in a group of 17 dogs suffering from lesions of the nervous system. C.s.f. studies were also made on a group of 22 dogs hyperimmunised against distemper. The diagnostic significance of the changes is discussed.

Acknowledgments.—I should like to express my thanks to Mr. Hodgman, M.R.C.V.S., and my other scientific colleagues at the Canine Research Station for their interest and help. I should also like to thank Miss J. Clark, my technician, and Mr. Pickford and his kennel staff.

Current Literature

ABSTRACTS

The Use of Blood Culture in the Routine Diagnosis of Anthrax. THOMSON, P. D. (1955). *J. comp Path. Therap.* **65.** 1-7.

A technique was developed which increased the number of confirmations of the presence of anthrax organisms in swabs from suspected cases; three times as many positive results as the usual guinea-pig inoculation method were obtained. It also obviated the disadvantage of the latter method, that is, the death of an occasional guinea-pig from an intercurrent infection within the statutory period of six days.

The swabs of blood or exudate were incubated overnight in a small volume of fresh serum or defibrinated blood. Suitably stained smears of the incubated fluid showed, in positive cases, anthrax organisms with well-marked capsules. Anthracoids never showed capsule formation.

The technique was also used in conjunction with guinea-pig and mouse inoculations when feedingstuffs were screened for the presence of anthrax organisms. The material for examination was treated to concentrate any spores present and inoculated into a blood tube and subcutaneously into two guinea-pigs and six mice. The blood culture was examined by smears; the animals by smears and cultures. The mouse test appeared more sensitive than either of the other two methods but a combination of all three yielded most positive results.

M. B. H.

The Intravaginal Inoculation of Guinea-pigs as a Method of Demonstrating *Vibrio foetus* in the Semen of Infected Bulls. POWER, J. H. (1954). *Irish Vet. J.* **8.** 238-242.

The author describes a modification of the method devised by Adler (1953) for the isolation of *Vibrio foetus* from the semen of infected bulls. The method was used successfully in the case of a bull from a herd in which positive mucus agglutination tests for *V. foetus* had been obtained. A note added to the end of the article states that the method had also been used successfully in a second case.

Two semen samples were collected from the bull using sterile apparatus, and were stored at 4° C. Six two-month-old female guinea-pigs, not obviously pregnant, were selected from stock and each received 1 mg. of stilboestrol diproprionate by the intramuscular route, on three occasions, to induce oestrus. 0.25 ml. of each of the two semen samples was

References

BERNHARD, A. (1924). *J. Lab. Clin. Med.* **9.** 753.
BROOK, G. B. (1936). "Experimental and Clinical Studies of the Spine of the Dog." London: Baillière, Tindall & Cox.
HARRISON, G. A. (1949). "Chemical Methods in Clinical Medicine." 3rd edition. p. 382. London: Churchill.
KING, E. J., HASLEWOOD, G. A. D., & DELORY, G. E. (1937). *Lancet.* **i.** 866.
TEUNISSEN, G. H. B., & VERWER, M. A. J. (1953). *Proc. 15th Int. Vet. Cong., Stockholm.* Vol. II, Part 1, p. 1022.

inoculated into the vagina of each of the guinea-pigs on the same day as the third injection of stilboestrol. As the semen had been stored for 14 days before examination for this use a second dose of pooled ejaculate was given on the following day.

The guinea-pigs were killed on the seventh or eighth day after the first dose of semen. The uterus was removed asceptically and cut into five portions; four of these portions were inoculated into peptone-blood-broth and the fifth was ground up in saline and inoculated on to an ox-blood agar plate. The cultures were incubated at 37° C. in 10 to 20 per cent. CO_2.

Two guinea-pigs were pregnant and neither of these gave *V. foetus* in culture. Of the other four animals, three yielded pure cultures of the organism.

[Abstractor's Note: Although not mentioned in the article the use of control guinea-pigs might be advised.]

M. B. H.

Reference

ADLER, H. C. (1953). *Nordisk Veterinarmedicin.* **5.** 454.

A Method of Correcting Patellar Luxations. PRICE, D. J. (1955). *N. Amer. Vet.* **36.** 132.

This method is a modification of that described by Städer who anchored the patella to the fabella by means of a strip of fascia lata.

Nine dogs have been successfully operated upon by this modified technique.

Under general or epidural anaesthesia the femoro-tibial joint region is exposed by a crescentic skin incision extending on the lateral aspect of the limb, from the mid shaft of the femur to the upper third of the tibia. The skin flap is reflected anteriorly and the subcutaneous fascia is dissected from the lateral aspect of the patella and adjacent biceps femoris and fascia lata. By means of a traumatic suture needle, stainless steel wire (28 to 30 gauge) is inserted into the ligamentous tissue and periosteum of the patella in the direction of its long axis. The lateral fabellar bone is now exposed through an incision in the biceps femoris and the needle carrying the wire penetrates the fabellar ligaments.

The wire is knotted with its other free end. In knotting the wire one must see that there is adequate tension to keep the patella in its normal position.

The wound in the biceps femoris is closed with chromic gut and the fascia is sutured back into position with similar material. The skin wound is coapted with wire or nylon. Exercise is restricted for two weeks and during the first week the limb is kept in a semi-flexed position by means of a Thomas splint.

BOOKS RECEIVED

The Popular Boxer by Elizabeth Summerfield. The Popular Dog Publishing Co., Ltd., Hutchinson House, W.1. Price 12s. 6d.

Antibiotic Selectivity in Poultry Nutrition. A review of the literature by R. C. Klussendorf, D.V.M, obtainable from the Commercial Solvents Corporation, Terre Haute, Indiana, U.S.A., on request.

FULBRIGHT TRAVEL GRANTS

Under the provisions of the Fulbright Programme, travel grants are available to citizens of the United Kingdom and Colonies to go to America for an academic or educational purpose, such as study, research, lecturing, etc. All awards are competitive.

The basic criteria for the award of a travel grant are as follows:—

Applicants must hold a good University degree or recognised professional qualification prior to actual departure. They must possess a guarantee of financial support in dollars for the proposed period of the visit to America. They must be citizens of the United Kingdom or Colonies, and are expected to return to reside permanently in their home countries.

Graduate students must show proof of admission to an American institution of higher learning for a minimum period of nine months. In the case of medical internships, the hospital to which the applicant hopes to go must be acceptable to his registration body in the United Kingdom. Candidates should be free of National Service obligations. Grants to graduate students are valid for a period up to three years, but they are subject to annual renewal over this period.

Professors, lecturers and senior research workers must intend to spend at least three months in the United States (exclusive of transatlantic travel time), of which about two-thirds should be spent at one university or recognised research institution. Proof of affiliation is necessary. Grants cannot be given for attendance at conferences alone. Grants may be extended up to a period of two years, subject to satisfactory appointments and continued dollar support.

Four years must elapse from the date of return from America before a second application may be made for a Fulbright travel grant.

Travel grants are available for travel to America between June 1st, 1956, and April 1st, 1957, for those in the lecturer/research scholar category. Those in the graduate student category are expected to go to America for the academic year beginning in September. All travel grants cover the cost of direct travel between a candidate's home in the United Kingdom or Colonies and the destination in America. The Commission arranges bookings for successful applicants. No allowances are made for dependents' travel.

The closing dates in this competition are: March 15th, 1956, for those travelling between June 1st and July 31st, 1956; June 1st, 1956, for those travelling after August 1st, 1956.

Those wishing to apply are first asked to fill up a record card. This in itself does not constitute an application. Full-length application forms are sent only when candidates indicate that their plans are complete, which must be before the appropriate closing date. Full-length applications should be submitted via the Head of the candidate's College or University or employing body.

Applications should be made to the United States Educational Commission in the United Kingdom, 55, Upper Brook Street, London, W.1.

News and Comment

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

Members of the Parliamentary and Scientific Committee—on which the profession is represented—were honoured by the presence at a luncheon at the House of Commons of H.R.H. The Duke of Edinburgh. The distinguished company present included:—

Sir Hugh Linstead, Chairman; Lord Adrian; Mr. A. J. Champion; Sir John Cockroft; Sir David Eccles; Viscount Falmouth; Lord Glyn; Sir Charles Goodeve; Sir Ian Heilbron; Dr. A. V. Hill; Professor R. P. Linstead; Mr. Reginald Maudling; Mr. Herbert Morrison; Sir Frank Markham; Dr. A. D. Merriman; Lord Salisbury; Lord Samuel; Sir Ernest Smith; Sir Henry Tizard; Professor Sir Alexander Todd; Sir Wavell Wakefield; Lord Waverley; Dr. S. Whitehead; Dr. W. R. Wooldridge; Sir Owen Wansbrough-Jones; Lt.-Commander Michael Parker and Lt.-Commander Christopher Powell.

After luncheon, in the course of a discussion, the Duke expressed the view that learned men were not called upon to try to express the work upon which they were engaged in such terms as would necessarily be understood by the ordinary layman. He doubted, indeed, whether such a thing was possible, though among those who differed from him subsequently were Lord Salisbury and Lord Waverley.

The royal guest showed so much interest in what was said, and took so interested a part in it, that the discussion was informally prolonged and continued for an hour in another room at his suggestion.

UNIVERSITY NEWS

Queen's University, Belfast

The George Scott Robertson Memorial Lecture

The memorial lecture for 1955 was given by Sir Thomas Dalling, D.SC., LL.D., M.A., F.R.C.V.S., F.R.S.E., on Friday, October 28th, at 3 p.m., in the Whitla Hall of the University. Professor H. G. Lamont of the Department of Comparative Pathology presided. Before introducing the speaker, Professor Lamont referred to the ability and genius of the late Dr. Scott Robertson and his abiding love and interest in Ulster agriculture.

The subject chosen by the Committee responsible for the arrangements was "The Impact of Modern Farm Husbandry on Animal Health."

Sir Thomas held a large audience enthralled for upwards of one hour and during the course of the lecture covered such widely diversant subjects as modern transport and modern grassland improvement. He showed that modern transport had intensified the risks of spreading infection, citing as an example the outbreak of foot-and-mouth disease in Canada in 1953. Sir Thomas dealt with the changing face of agriculture and showed that the demand for more food, both cereal and protein, had influenced animal health in a variety of ways. The lecture is to be published.

A vote of thanks was proposed by the President of the Ulster Farmers' Union, Mr. Harry West, M.P., and seconded by Professor Morrison, Head of the Animal and Crop Husbandry Department in the Faculty of Agriculture.

Mr. West congratulated Sir Thomas on the masterly manner in which he had delivered the lecture and went on to say that the veterinary profession in Britain should be proud of Sir Thomas and what he was doing throughout the world.

Professor Morrison remarked that what Sir Thomas had said would give everyone food for thought. It was clear that the agriculturist had much to gain from close co-operation with the veterinary scientist and he personally gave his full support, indeed, when it came to a question of health and preventive medicine, not only the veterinary surgeon, but the animal nutritive expert, the crop specialist, the soils chemist, and so on, were all vitally concerned. He thanked Sir Thomas for a most interesting address.

Prior to the address, Sir Thomas Dalling was entertained to luncheon by the University.

Agrarian Society

Through the good offices of the President of the Agrarian Society (Professor H. G. Lamont) the members of the Society were invited by the North of Ireland Veterinary Association to attend a general meeting on Friday evening, October 28th, in the large lecture hall of the Agricultural Faculty. The guest speaker was Sir Thomas Dalling. Sir Thomas chose as his subject "Some Aspects of Veterinary Work in Different Parts of the World."

The address proved most interesting. Professor Baskett, in moving a vote of thanks, referred to Sir Thomas Dalling's great services, not only to British agriculture, but to the many countries which he had visited, and Dr. W. R. Kerr seconding, referred to the importance of education and the training of the veterinarian and said that Sir Thomas had done much to promote veterinary education and services and that as the result of his efforts many countries would benefit in improved human nutrition. The members of the Agrarian Society were entertained to tea after the meeting by the North of Ireland Veterinary Association.

Liverpool

In the Faculty of Veterinary Science the Council of the University has made the following appointments:—

Lecturer in Veterinary Pathology, Mr. J. M. K. Mackay, M.R.C.V.S.; Lecturer in Animal Husbandry, Mr. T. J. Forbes, B.AGRIC. (BELFAST); Assistant Lecturer in Veterinary Pharmacology, Mr. J. Sanford, B.V.SC., M.R.C.V.S.

The following passed the Second Examination, Part III (Animal Management) for the degree of B.V.Sc., November, 1955.

Batt, R. A. L.; Neil, D. H.; Procter, G. M.

VETERINARY APPOINTMENTS

Mr. W. M. Brownlie, B.SC., M.R.C.V.S., D.V.S.M., is appointed Head of the Veterinary Science Division of the Research Department of Messrs. Boots Pure Drug Co., in succession to Professor D. L. Hughes, F.R.C.V.S., who was recently appointed to the Chair of Veterinary Pathology at Liverpool University. Mr. Brownlie joined the research staff in 1943, and has acted as deputy to Professor Hughes since 1950.

The Company has also decided to create a new department, to be called the Agricultural Service Department. Mr. N. M. Black, M.R.C.V.S., who has been Veterinary Adviser on the commercial side since 1948, will take charge. The new department will be responsible for advisory work, the initiation of development, and the co-ordination of research in the veterinary, agricultural and horticultural fields.

MINISTRY OF AGRICULTURE, VETERINARY FIELD STAFF CHANGES

It is announced that Mr. H. S. Caldwell, F.R.C.V.S., D.V.S.M., Divisional Veterinary Officer at Aylesbury, has been seconded to the F.A.O. for one year, and Mr. A. C. Gillespie, B.SC., M.R.C.V.S., Veterinary Officer, has been temporarily promoted to Divisional Veterinary Officer and will remain at Aylesbury.

Mr. D. K. Bryson, M.R.C.V.S., Veterinary Officer at Carmarthen, has been transferred to Chelmsford.

FOWL PEST IN LANCASHIRE

During the last few weeks about 30 outbreaks of fowl pest have been confirmed on premises in central Lancashire.

With a view to bringing the situation under more effective control, the Minister of Agriculture, Fisheries and Food, and the Secretary of State for Scotland have made an Order entitled The Live Poultry (Mid Lancashire) Order, 1955. The main effect of this Order is to prohibit as from November 12th the movement of live poultry (except day-old chicks and hatching eggs) into, out of and within the following area of central Lancashire.

The County Boroughs of Preston and Southport.

In the administrative County of Lancaster

The Borough of Chorley, the Petty Sessional Divisions of Leyland and Walton le Dale.

Petty Sessional Division of Blackburn

The parishes of Livesey, Pleasington and so much of the parish of Samlesbury as lies within the petty sessional division.

Petty Sessional Division of Leyland Hundred

The parishes of Hesketh with Becconsall, Tarleton, Bretherton, Rufford, Croston, Mawdesley, Eccleston, Heskin, Euxton, Coppull, Charnock Richard, Heath Charnock, Whittle-le-Woods, Heapey, Brindle, Wheelton, Withnell, Hoghton and Ulnes Walton.

Petty Sessional Division of Ormskirk

The parishes of Burscough, Halsall and Scarisbrick.

Petty Sessional Division of Southport

The parish of North Meols.

THE REGISTER OF VETERINARY SURGEONS

The name of Mr. Thomas Maldwyn Evans, of 7, Chapel Street, Brynamman, Carmarthenshire, has been restored to the Register of Veterinary Surgeons.

PERSONAL

Birth

KIERNAN.—On October 31st, 1955, at the Gables Maternity Hospital, Peterborough, to Isabel and Neville Kiernan, M.R.C.V.S., of 6, South Road, Oundle, Northants, a daughter, Pamela Margaret.

PROFESSOR J. J. O'CONNOR

The death of Professor J. J. O'Connor at the age of 81 removes a distinguished figure from the veterinary scene. As first President of the Irish Veterinary Council, President (twice) of the Veterinary Medical Association of Ireland, and its Secretary for 20 years, he has rendered notable service to the profession by whom he will be greatly missed.

Professor O'Connor was born in The Ward, Co. Dublin, in 1874. He was educated at Clongowes, Terenure and Castleknock College, going thence to the then Royal University. He took the professional qualification at Edinburgh in 1899.

During the Boer War he served as a veterinary officer on board ship, and later was appointed to a teaching post in the Edinburgh School. With the opening of the Dublin College he became its first professor of surgery, retaining that post until 1935, when he was appointed Principal. He retired in 1940.

As a surgeon Professor O'Connor built up a notable reputation which reached its zenith in the public eye in 1939, when he operated successfully on Windsor Lad, the 1934 Derby winner. In addition to horses, he had many surgical successes with captive wild animals.

He is survived by two sons, one a member of the profession, and a daughter.

COMING EVENTS

November

23rd (Wed.). Supper Dance of the Scottish Metropolitan Division, B.V.A., in collaboration with the Local Ladies Guild of the Victoria Veterinary Benevolent Fund, at the George Hotel, Edinburgh.

24th (Thurs.). Autumn Meeting of the Eastern Counties Division, B.V.A., at the Bedford Lodge Hotel, Newmarket, 12 noon.

Meeting of the Essex Veterinary Division, B.V.A., at the Essex Institute of Agriculture, Writtle, Nr. Chelmsford, 7.30 p.m.

Autumn Meeting of the Dumfries and Galloway Division, B.V.A., in the County Hotel, Dumfries, 2.15 p.m.

25th (Fri.). Ordinary General Meeting of the Royal Counties Division, B.V.A., at the Caversham Bridge Hotel, Reading, 2.30 p.m.

Ordinary General Meeting of the Society for the Study of Animal Breeding at the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 11.30 a.m.

30th (Wed.). Meeting of the Southern Counties Division, B.V.A., at Salisbury, 7.30 p.m.

Meeting of the West of Scotland Division, B.V.A., in St. Enoch's Hotel, Glasgow, 2.30 p.m.

December

1st (Thurs.). General Meeting of the Central Division, B.V.A., at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

2nd (Fri.). Ordinary General Meeting of the South Wales Division, B.V.A., at the Park Hotel, Cardiff, 2 p.m.

5th (Mon.). Annual Dinner of the Centaur Society, University of Bristol, at the Hawthorn's Hotel, Bristol, 7 p.m.

9th (Fri.). Dinner and Dance of the North Wales Division, B.V.A., in the Imperial Hotel, Llandudno, 7 p.m.

R.C.V.S. EXAMINATIONS

December 8th, Thursday.—M.R.C.V.S. Written Examinations.

December 9th, Friday.—M.R.C.V.S. Written Examinations.

December 12th, Monday.—M.R.C.V.S. Practical and Orals commence (Panels "A" and "B").

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ayr. Glen Leitch Farm, Fenwick, Kilmarnock (Nov. 8).

Ches. Deva Hospital, Upton, Wirral; Redmoor Farm, Higher Disley, Stockport (Nov. 8).

Cornwall. Glenleigh, Hewaswater, St. Austell (Nov. 11).

Derby. Home Farm, Yeldersley, Ashbourne (Nov. 8); Greenlow Farm, Aldwark, Grange Mill; Cold Eaton Farm, Parwich, Ashbourne; Valley Farm, Mosborough (Nov. 11); Middleton by Youlgreave, Tor Farm, Bakewell (Nov. 12).

Kirkcudbright. Cairniehill Farm, Borgue (Nov. 8).

Lancs. Raingill Farm, Slaidburn, Clitheroe (Nov. 14).

Northumberland. Spital Shield Farm, Hexham (Nov. 14).

Salop. Wood Farm, Marchamley, Shrewsbury (Nov. 14).

Staffs. Cotton Lane Farm, Cotton, Oakamoor, Stoke-on-Trent (Nov. 12); 122, Holding, Bangley, Tamworth (Nov. 14).

Warwicks. Oaks Farm, Back Lane, Meriden, Coventry (Nov. 8).

Westmorland. Low Sampool, Levens, Kendal (Nov. 9).

Yorks. School Wood Farm, Moorside, Ilkley; Smallhedges Farm, Sykehouse, Goole (Nov. 11).

Fowl Pest

Essex. Tiffaynes Farm, Burnt Mill Road, North Benfleet, Wickford (Nov. 10); The Priory, Nevendon Road, Wickford (Nov. 12).

Lancs. 56, Summerwood Lane, Halsall, Ormskirk (Nov. 8); Chapel House Farm, Gill Lane, Longton, Preston (Nov. 10); Mill House Farm, New Street, Halsall, Ormskirk (Nov. 11).

Norfolk. Trimley Main Road, Repps, Great Yarmouth; Holmlea, Norwich Road, Yaxham, East Dereham; The Paddock, Ling Road, Palgrave, Diss; Moss's Allotments, Cobholm, Great Yarmouth; No. 1, Council Houses, Tharston, Norwich; Poplars Farm, Tharston, Norwich (Nov. 8); Haugh Corner Farm, Banham, Norwich; Somerset Farm, Forncett St. Peter, Norwich; Poultry Premises, Gunn Street, Foulsham, East Dereham; The Homestead, Forncett St. Peter, Norwich (Nov. 9); Mill Farm, North Tuddenham, East Dereham (Nov. 10); Bell Farm, Lyng, Norwich; May Farm, Mattishall, East Dereham; Marsh Lane, New Buckenham, Norwich (Nov. 11); Heath Farm, Poringland, Norwich; Norwich Road, Yaxham, East Dereham; Tuck Away, Station Road, Great Moulton (Nov. 12); 12B, Council Houses, Great Moulton, Norwich (Nov. 13).

Sussex. Spinney's Edge, Back Lane, Cross-in-Hand, Heathfield (Nov. 14).

Swine Fever

Devon. Orchard Farm, Buckerell, Honiton (Nov. 9); Shutelake Farm, Butterleigh, Cullompton (Nov. 14).

Dorset. Frogmore Farm, Wheelers Lane, Knighton, Canford Magna, Poole (Nov. 9).

Dunbarton. No. 10 Holding, West Cochno, Duntocher (Nov. 10).

Essex. Wonderview, Great Burches Road, Thundersley (Nov. 9); "Rosella," Chaseside, High Laver, Ongar (Nov. 14).

Hants. Four Winds Farm, Throop, Bournemouth (Nov. 14).

Kent. Vincent Farm, Manston Road, Margate (Nov. 14).

Lanarks. Sidehead Farm, Stonehouse (Nov. 11).

Lancs. Cottams Farm, Whalley Road, Clayton-le-Moors, Accrington; Orford Farm, School Road, Warrington (Nov. 9).

Lincs. The Bakery, Nuttoft, Alford (Nov. 12).

Norfolk. Rope-walk Allotments, Salter's Road, Kings Lynn (Nov. 9).

Northants. Onley Grounds Farm, Barby (Nov. 14).

Staffs. Preston Farm, Dunston (Nov. 9); Rugeley Road Piggeries, Bates Corner, Hednesford (Nov. 10).

Somerset. Higher Horwood Farm, Wincanton (Nov. 14).

Westmorland. The Piggeries, Holme Lyon, Burneside, Kendal (Nov. 14).

Worcs. 356, Hagley Road, Hasbury, Halesowen, Birmingham (Nov. 9).

Yorks. Upper Giles Farm, Shelf, Halifax (Nov. 9); Langley Hall Farm, Southey, Sheffield, 5; Howdenclough Farm, Birstall, Leeds (Nov. 11); 154, Lowerhouses Lane, Huddersfield (Nov. 14).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

THE PROFESSION AND THE PRESS

Sir,—Your correspondents Messrs. Kirkwood and Meikle have, very rightly, drawn attention to the need for much improved public relations work on behalf of the profession. This point of view, of course, has been one held by many members of the profession for some time. For example, I myself referred to it in my Presidential address to the British Veterinary Association (then the N.V.M.A.) as long ago as 1942, and addressed the Central Veterinary Society on the same topic in 1946.

Some progress has been made in these matters in the last few years but everybody would agree that further development of our public relations along sound lines compatible with the ethical position of the profession is desirable. It may be that one of the solutions to this problem would be the appointment of a veterinary surgeon to our B.V.A. staff who is interested in public relations work.

Your correspondents have quoted the recent publications referring to the veterinary profession that have appeared in *The Farmer & Stock-breeder* and allege that nothing whatever has been done to counteract the ill effects of this publicity. Whilst little has appeared in the Press it would be quite wrong to conclude that the B.V.A. did not take immediate and forceful action in this matter but, like so many public relations problems, action is often far sounder when it is done *in camera* than when it itself receives the highlight of full publicity. The Officers of the B.V.A. in conjunction with the Chairman of the Publicity Committee, acted quickly and contact was made with the Editor of this journal. Conversations were held, the result of which it is believed will be of considerable value to the profession and its relations with the agricultural Press.

Unfortunately it is not possible to detail these matters, but a full account was given by the President to the Council of the B.V.A. at its recent meeting, although much of his report was made in committee.

The second point about publicity refers to correspondence concerning cruelty to animals by children which has proceeded in *The Times* without any authoritative participation by the profession. This, as your correspondents say, is only one of many questions concerning animals which could be taken up more vigorously if the profession had one of its members acting as a full time public relations officer. Much could be done by a first-class P.R.O. who is not a member of the profession, but there are so many angles that arise in such correspondence needing immediate interpretation that it would be desirable in my view to find a suitable young veterinarian to undertake this important work. On the other hand the path he followed would be a difficult one, as he would be open to a variety of criticisms which would not necessarily arise if he were not a member of the profession.

Much discussion is still needed, but I agree with your correspondents that it is a matter that should not be delayed long.

Yours faithfully,
W. R. WOOLDRIDGE.

14, Ashley Place,
Westminster,
S.W.1.

November 16th, 1955.

A SURVEY OF CANINE DISTEMPER

Sir,—We have read with interest the comments of Dr. Marcus M. Mason on our "Survey of Canine Distemper" and wish to express appreciation of the close attention which he has given to it.

He makes critical reference to the mode of selection of cases in this work and implies that our conclusions were drawn only from a study of fatal cases. This was largely so, but some attention was paid by us to the non-fatal cases (*Vet. Rec.*, **66,** 608, 609 and 629). While we acknowledged the occurrence of mild distemper which often cannot be confirmed we find that our clinical criteria are applicable to most cases, including a proportion which recover. In the survey series of 50 dogs pathological examination was regarded as essential to confirm or refute this clinical diagnosis.

Although some clinical and histological variation was found, the same general pattern of clinical signs and *post-mortem* lesions has occurred with a high degree of consistency in a series which now extends to more than 200 dogs.

The histological changes to which we attach diagnostic value are:—

(i) Cytoplasmic, acidophilic inclusion bodies which in the majority of cases occurred in various tissues throughout the body. (Some evidence of the antigenic specificity of these inclusions has recently been given by Moulton & Brown (1954) using a fluorescent antibody technique.)

(ii) An interstitial broncho-pneumonia often associated with alveolar epithelialisation.

(iii) Disorganisation of the epidermis, of the pads especially, which varied with the duration of the lesion and to some extent with the individual.

(iv) Encephalitis, often accompanied by demyelination, with the severest changes usually present in the cerebellum and brain stem.

(v) Acute degeneration of lymphoid tissue or, in the later stages, regenerative hyperplasia.

The lesions ascribed to other pathogens do not, in our opinion, warrant the emphasis placed on them by Dr. Mason as they are quite subsidiary to the major picture, inconstant and, in the majority of cases, mild and strictly localised.

In order to support his conclusions Dr. Mason has composed the symptoms and pathology of six diseases to produce a picture similar to that of the survey. By this method, the incidence of signs and lesions of almost any one disease can be created by manipulating those of other entities, even without the introduction of a hypothetical one.

We, therefore, maintain our previous views and further state:—

(1) We find our clinical criteria invaluable in diagnosing a canine disease which presents a remarkable constancy of generalised tissue changes.

(2) That this group of criteria and tissue changes appears to be distinct from any caused by contagious hepatitis, toxoplasmosis, leptospirosis, streptococcal or staphylococcal septicaemia, salmonellosis or intestinal parasites. We consider the presence of cytoplasmic inclusion bodies extremely important in differential diagnosis.

(3) We are unaware of any evidence that another virus exists which is capable of causing a similar clinical and pathological picture in the dog.

(4) By calling the entity described "distemper" we emphasise rather than mask the need for specific diagnosis.

We are prepared to alter our opinion, but see no reason yet to deviate from the views we expressed last year.

Yours faithfully,

I. M. LAUDER,
D. D. LAWSON,
W. B. MARTIN,
R. S. F. CAMPBELL.

University of Glasgow Veterinary School.

November 5th, 1955.

MOULTON, J. E., & BROWN, C. H. (1954). *Proc. Soc. exp. Biol. Med.* **86**. 99.

OPENING OF CONGRESS

Sir,—May I add my voice in approval of Mr. Halpin's suggestion that, at the opening of our Congress, an opportunity be given to commend it, together with our future year's work to God.

Yours faithfully,

J. E. BEACH.

Plas Newydd,
Llanfwrog,
Ruthin,
Denbighshire.

November 7th, 1955.

ELECTRICAL STUNNING AND HUMANE SLAUGHTER OF ANIMALS

Sir,—I thank Dr. Croft for giving instances from my book which she considers to be "statements taken out of their context so that they no longer convey the author's original meaning" as this gives me a chance of clarifying these points.

(i.) Dr. Croft considers that my quoting Roberts's work confuses apparatus made for electrocution (current through body) with apparatus designed for stunning (current through the brain). May I point out that this passage occurs in that part of my book where general electric methods are discussed and not in that part dealing with stunning. My intention in quoting Roberts's work was only to give, as I wrote, "another example of the unreliability of electrical methods" after having shown the dangers which occur even in machines designed for human electrocution. Although it seemed to me that my meaning was clear, I am, in fact, adding in the third edition a sentence which will definitely preclude any further misunderstanding.

(ii.) In the second example the error which Dr. Croft points out, if error it be, does not occur in my book at all, but in a review of my book which was circulated with later copies.

(iii.) In her third and last example Dr. Croft seems tacitly to admit that there is no question of my having taken a quotation out of its proper context, but to criticise the fact that I omitted Col. Hickman's conclusions. To mention them seemed to me unnecessary as I drew the attention of the reader to the fact that "a good description of the apparatus, by Col. Hickman appeared in THE VETERINARY RECORD," giving the volume and page. There the reader would be able to find the personal conclusions of Col. Hickman clearly set out.

Sir, I regret to have had to encroach again upon your valuable space.

Yours faithfully,

S. D. SASSOON.

15, Sollershott East,
Letchworth,
Herts.

November 14th, 1955.

TICKBORNE FEVER IN DAIRY CATTLE

Sir,—I was most interested in the letter of Messrs. Tutt and Loving suggesting a tickborne fever of dairy cattle. Many farms in west Cornwall are heavily infested with ticks and redwater is common.

On such farms I have frequently encountered cases of pyrexia ranging from 105° to 107° F. with inappetence and sudden fall in milk yield. Most return to normal within seven days, a few are protracted, and a minority of cases are so severe that inappetence is complete, there is a tucked-up appearance, and a grave prognosis is warranted. Such cases leave a diminished milk yield.

Careful clinical examination fails to reveal any other abnormality but in nearly every case I have found ticks on the animal. Some have had redwater previously. However, since many healthy animals also carry ticks their responsibility is mere conjecture.

Isolated blood samples have proved negative though one sample was positive to rickettsia, and Queensland (Q) fever was suggested, although I understand that this disease is transmitted to man *via* milk but has no clinical signs in cattle.

Mr. Smythe has encountered this disease for many years in this practice and has treated more cases in brought-in animals than in indigenous cattle; but there can be little acquired immunity as in a few instances recurrent attacks at lengthy intervals have been noted. The older treatments were symptomatic being sodium salicylate as an antipyretic and aperients.

I have found that most cases respond well to five mega units of crystalline penicillin followed by a course of sulphanilamide with aperients if necessary.

Yours faithfully,

W. CLIFTON GREEN.

Beacon Street,
Falmouth,
Cornwall.

November 12th, 1955.